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**United States Patent** [19]**Danyluk et al.**[11] **Patent Number:** **5,974,869**[45] **Date of Patent:** **Nov. 2, 1999**[54] **NON-VIBRATING CAPACITANCE PROBE  
FOR WEAR MONITORING**[75] **Inventors:** Steven Danyluk, Atlanta, Ga.; Anatoly Zharin, Minsk, Belarus; Elmer Zanoria, Oak Ridge, Tenn.; Lennox Reid, Houston, Tex.; Kenneth M. Hamall, Peachtree City, Ga.[73] **Assignee:** Georgia Tech Research Corp., Atlanta, Ga.[21] **Appl. No.:** 08/971,101[22] **Filed:** Nov. 14, 1997**Related U.S. Application Data**

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[51] **Int. Cl.<sup>6</sup>** ..... **G01R 27/26**[52] **U.S. Cl.** ..... **73/105; 73/104; 324/458; 324/663; 324/686**[58] **Field of Search** ..... **73/104, 105; 324/663, 324/686, 690, 457, 458**[56] **References Cited****U.S. PATENT DOCUMENTS**

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*Primary Examiner*—Daniel S. Larkin*Attorney, Agent, or Firm*—Deveau, Colton & Marquis[57] **ABSTRACT**

A non-vibrating capacitance probe for use as a non-contact sensor for tribological wear on a component. The device detects surface charge through temporal variation in the work function of a material. A reference electrode senses changing contact potential difference over the component surface, owing to compositional variation on the surface. Temporal variation in the contact potential difference induces a current through an electrical connection. This current is amplified and converted to a voltage signal by an electronic circuit with an operational amplifier.

**10 Claims, 13 Drawing Sheets**